

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Storm Drainage Material
- B. Excavation and Bedding
- C. Laying Pipe
- D. Pipe Joint
- E. Backfilling
- F. Concrete Encasement

1.02 RELATED SECTIONS

- A. Trenching and backfilling for pipelines are specified in Section 33 05 28 - Trenching and Backfilling for Utilities.
- B. Catch basins, curb and gutter inlets, and manholes are specified in Section 33 05 16 - Utility Structures.
- C. Subsurface drainage system is specified in Section 33 46 00 – Subdrainage.

1.03 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for the site drainage system will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for the site drainage system indicated in the Bid Schedule of the Bid Form.
- B. Lump Sum: If the Bid Schedule indicates a lump sum for the site drainage system, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, Article 1.03.
- C. Unit Price: If the Bid Schedule indicates a unit price for the site drainage system, the unit-price method of measurement and payment will be as follows:
 - 1. Measurement:
 - a. Pipe will be measured for payment by the linear foot for each type and size, along the center line of the pipe, installed complete in place.
 - b. Trench excavation, bedding for pipe, backfill, pipe fittings and joints, concrete for pipe encasement, cradles, culverts, and incidentals will not be

measured separately for payment, and all costs in connection therewith will be considered as included in the linear foot measurement for pipe.

- c. Catch basins, manholes, and other utility structures will be measured separately for payment as specified in Section 33 05 16 - Utility Structures.
 - d. Concrete for headwalls and ditch closures will be measured by the cubic yard as specified in Section 03 30 00 - Cast-in-Place Concrete. Reinforcing steel for headwalls and ditch closures will be measured separately for payment as specified in Section 03 20 00 - Concrete Reinforcing.
 - e. Concrete for ditch lining will be measured by the linear foot for each type and width of ditch, along the centerline of the ditch. Reinforcing steel for ditch lining will not be measured separately for payment, but will be included in the linear foot measurement for ditch lining.
2. Payment: Site drainage system will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

1.04 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

- 1. AASHTO M36 Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
- 2. AASHTO M190 Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches

B. American Society for Testing and Materials (ASTM):

- 1. ASTM A760 Specification for Pipe, Corrugated Steel, Zinc-Coated (Galvanized)
- 2. ASTM C12 Standard Practice for Installing Vitrified Clay Pipe Lines
- 3. ASTM C14 Specification for Concrete Sewer, Storm Drain, and Culvert Pipe
- 4. ASTM C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- 5. ASTM C270 Specification for Mortar for Unit Masonry
- 6. ASTM C425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings
- 7. ASTM C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

8. ASTM C700 Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
 9. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
 10. ASTM D2564 Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
 11. ASTM D2665 Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
 12. ASTM D2680 Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping
 13. ASTM D2729 Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- C. California Code of Regulations, Title 24, Part 2, California Building Code, Chapter 21 and Chapter 21A, Masonry.

1.05 SUBMITTALS

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Shop Drawings: Submit detailed drawings that indicate site drainage in plan and section, including relationship to other systems, interfaces, and drainage structures, connections, alignment, grade, bedding and backfill, and other pertinent data.
- C. Product Data: Submit manufacturers' product data for pipe and pipe connection materials.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Pipe Connection Requirements: Ends of pipe shall be bell-and-spigot, grooved, shiplapped, or secured with couplings, collars, or other connection fittings to assure continuous alignment of pipe and leakproof joints.
- B. Clay Pipe:
 1. Pipe: ASTM C700, extra strength; for pipe 8 inches in diameter and under.
 2. Joints and Gaskets: ASTM C425.
- C. Concrete Pipe:
 1. Plain Pipe: ASTM C14, Class 3; for pipe less than 12 inches in diameter.

2. Reinforced Pipe: ASTM C76, Class III; for pipe 12 inches in diameter and larger.
3. Joints and Gaskets: ASTM C443
- D. Corrugated Metal Pipe: ASTM A760 or AASHTO M36, Type I pipe, bituminous coated in accordance with AASHTO M190. Furnish pipe complete with coupling bands and gaskets as required for watertight joints.
- E. Plastic Pipe:
 1. Pipe: PVC pipe conforming to ASTM D2665 or ASTM D2729 for pipe up to and including 6 inches in diameter, and ASTM D2680 or ASTM D2729 for pipe larger than 6 inches in diameter.
 2. Cement: ASTM D2564.
- F. Bonding Adhesive: Adhesive for bonding of mortar to concrete pipe and catch-basin and manhole openings shall be an epoxy-based bonding agent conforming to ASTM C881, Type V, tinted to show by visual inspection where it has been applied.
- G. Bedding and Backfill Material: Refer to Section 33 05 28 - Trenching and Backfilling for Utilities, and ASTM C12, for requirements.

2.02 MORTAR

- A. Mortar for pipe joints, catch-basin openings, and other locations where indicated shall be Type S mortar in accordance with Chapter 21 of the California Building Code, with a minimum compressive strength at 28 days of 1,800 psi.
- B. Mortar shall be job mixed in accordance with requirements of ASTM C270, including measurement, mixing, proportioning, and water retention.
- C. Accurately measure mortar ingredients and mix a minimum of three minutes after water has been added, in a mechanical batch mixer, using sufficient water to produce a workable and plastic consistency. Hand mixing will be permitted for small quantities only.
- D. Use mortar within 90 minutes after mixing. Discard mortar that has been mixed longer or that has begun to set. If necessary, mortar may be re-tempered within this time limit, by replacing water lost due to evaporation and by thorough remixing.

2.03 CONCRETE

- A. Concrete for headwalls, ditch closures, and lining or paving of ditches shall conform with applicable requirements of Section 03 11 00 - Concrete Forming, Section 03 20 00 - Concrete Reinforcing, Section 03 15 00 - Concrete Accessories, Section 03 30 00 - Cast-in-Place Concrete, Section 03 05 15 - Portland Cement Concrete, and Section 03 35 00 - Concrete Finishing. Provide Class 3000 - 1 inch concrete unless otherwise indicated.

PART 3 - EXECUTION**3.01 INSTALLATION OF PIPE****A. Excavation and Bedding:**

1. Excavate trenches as specified in Section 33 05 28 - Trenching and Backfilling for Utilities.
2. Bedding: Provide bedding as specified in Section 33 05 28 - Trenching and Backfilling for Utilities. Classes of bedding are defined in ASTM C12. Use class of bedding indicated. Where pipe is to be encased in concrete, place concrete against undisturbed soil.

B. Laying Pipe:

1. Lay pipe to line and grade indicated. If pipe is of the bell-and-spigot type, lay bells in cross-cuts cut in trench. Lay pipe with the bell or grooved end uphill.
2. Install clay pipe in accordance with applicable requirements of ASTM C12.
3. Place circular pipe having elliptical reinforcement with minor axis of the reinforcement in a vertical position.
4. Prevent dirt from getting into pipe joints.
5. Remove pipe that is cracked, checked, spalled, or damaged from the work.
6. Clean interior of pipe of cement, dirt, and extraneous matter as the work progresses.

C. Pipe Joints:

1. Pipe joints shall be made secure and watertight.
2. Employ appropriate equipment to draw the sections of the pipe tightly together.
3. Joints of bell-and-spigot pipe and tongue-and-groove pipe shall be filled with cement mortar so as to make a strong and watertight joint. Finish joints smooth on inside of pipe with cement mortar.
4. Inside joint recesses of pipe shall be buttered with cement mortar prior to closure of joint. After closure is made, the joint shall be pointed inside the pipe and excess mortar removed by means of an inflated swab or squeegee.

D. Backfilling:

1. Piping shall not be covered with backfill material, until inspected, tested, and approved by the Engineer.

2. After making up pipe joints, fill space between pipe and sides of trench with bedding sand or pea gravel half-way up the pipe. Both sides shall be filled for full width of trench at same time and carefully compacted so as to hold the pipe in its proper position.
3. After pipe has been installed, inspected, and approved, place and compact backfill as specified in Section 33 05 28 - Trenching and Backfilling for Utilities.

E. Concrete Encasement:

1. If pipe is indicated to be entirely or partly embedded in concrete, support and brace pipe in a manner that will prevent movement or displacement of pipe during testing and during placement and consolidation of concrete.
2. Place concrete as specified in Section 03 30 00 - Cast-in-Place Concrete, being careful to consolidate concrete under and around pipe without displacing pipe.
3. Provide minimum Class 3000 concrete as specified in Section 03 05 15 - Portland Cement Concrete.

3.02 CONCRETE

- A. Provide and place concrete reinforcement and concrete as indicated and in accordance with Section 03 20 00 - Concrete Reinforcing, and Section 03 30 00 - Cast-in-Place Concrete. Provide headwalls and ditch closures with "smooth form finish" and ditch lining with "floated finish" in accordance with Section 03 35 00 - Concrete Finishing.

END OF SECTION 33 40 00